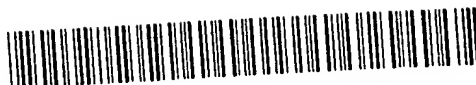


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(71) Applicant: Venelente Sociedad Limitada
28230 Las Rozas (Madrid) (ES)

(72) Inventors:

• MARCOS CARTAS, Vicente Angel
E-28017 Madrid (ES)

- JIMENEZ RIVERO, Jose Luis
E-28017 Madrid (ES)
- VIGIL MORANT, Jose Ramon
E-28017 Madrid (ES)

(74) Representative: Molero Moraleda, Felipe et al
Paseo de la Castellana, 173 bajo izq.
28046 Madrid (ES)

(54) **MANAGEMENT AND CONTROL OF DISPENSING MACHINES THROUGH THE DIGITAL MOBILE TELEPHONE CONTROL CHANNELS**

(57) The system provides for the control and management of a large number of dispensing machines through the use of digital mobile telephone control channels, without having to use voice channels. Each dispensing machine has a controller which collects all data sent by sensors, such as the impedance of certain circuits, vibration, temperature and the like. Then the data is sent by means of a wireless digital modem through the control channels to a host computer which processes and stores the data. The host computer can also control certain operation characteristics of each dispensing machine such as reset, disablement and the like. The use of the control channels in order to send messages results in cost saving with respect to the use of voice channels.

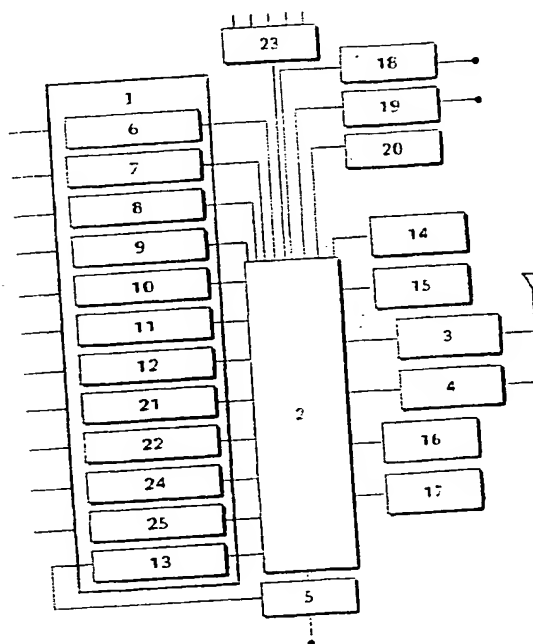


FIG. 2

EP 1 119 210 A1

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Description

[0001] The invented system permits the running management and control of vending machines adding new methods of inspection related to fraud in the running through specific sensors adapted to the new designs of vending machines and using a new communication system with the operating station by means of a mobile cellular telecommunication existent network but without using the voice channels, in other words, without making a phone call, using the specification of the mobile cellular paneuropean GSM system and more specifically the systems of sending short messages in the call network or call or broadcast channel defined by the Special Mobile Group (SMG) of the European Telecommunication Standard Institute (ETSI) documents 07.05 and 07.07 of the specification PHASE II GSM of July 1996.

[0002] Using this new form of Telecommunication now available has among other advantages the reliability on account of being entirely supported in a digital system having an error correcting code and the plain confirmation of the reception of the message. Moreover, the operative cost due to the fact that it is not necessary to make a telephone call to send data to the central station or from it, through this system, and the low cost of the implementation because of using a communication network that already exists with large worldwide coverage that even allows to control the running of vending machines in other different countries. This is a new aspect of great interest in view of the disappearance of economic borders and the economy globalization, within a minimum operative cost because of not making international calls and not counting as a phone call through a voice channel.

[0003] The aim is to obtain a cheap and reliable method to eliminate fraud in money takings, real time control of the takings, to save costs and to study the profitability of new products for companies in the field of vending machines of any sort or model.

TECHNOLOGY FIELD

[0004] The technology field to which this invention is referred to is the one of the operation of any sort of vending machine or that offers a service to the user previous payment of a quantity, internationally known as vending machines and in particular to its remote control by means of low cost.

[0005] The use of vending machines that we could define as those machines that sell products or that offer a service to the user previous payment of a quantity, originally conceived as a means to offer a service in places of large public attendance, has been extended in the developed countries due to the lack of human labour. So, nowadays we can find these machines or a lot of them in shopping centres, offices, petrol stations, halls of public display and exhibitions, competing in an efficient way with hotel and catering services.

[0006] Nowadays there are vending machines that offer drinks, candies, sandwiches, ice-creams, french fries, newspapers, hot pizzas, video-club, laundry, photocopies, sending faxes, internet connection, instant photos, coffee, infusions, solubles and its derivatives, washing car machines, vacuum cleaner activated by coins and, in a wider sense, telephone boxes where we obtain the right to make a call over on the payment of a quantity, banks' cash dispensers where cash is given in advance through the charge of a commission that is charged in the same account of that of the credit card, and parking machines that permit the exit of the vehicles previous payment of the indicated rate can be also considered vending machines.

[0007] Operation fraud in these machines is multiple. On one hand, their takings control is normally carried out through a cashing up of the collection of the currency and its comparison against the meter reading that is connected to the electronic meter of the vending machine counting each passing pulse that the coins' admisor sends through the acceptance of a valid coin, or through the acceptance of an electronic through the acceptance of a valid coin, or through the acceptance of an electronic means of payment mentioned above. It is evident that the employee in charge of the maintenance replacing the product in the machine can manipulate the meter cutting or unwelding the cables that come from the acceptance of the means of payment and go to the meters of accepted means of payment.

[0008] On the other hand, the employee can replace products that have not been supplied by the operator company but that have been acquired by himself and which collection can afterwards be removed from the machine for its own benefit.

[0009] Other problems found in the operation are to replace accurately each product channel so that the machine has a minimum stock of each product that is permanently available. The money from the collection must be taken and enough change must be foreseen. In a typical operation, the machines are located in a map and routes are assigned to the employees in charge of the maintenance so that costs are minimized in the trips. It often occurs that due to the fact of not knowing the quantity of remaining product in the machines, periodically visits are programmed without being this system, as we will see later, the best. For example, soda or ice creams sales are highly seasonal being possible that in one hot spring week-end as many products as in weeks during winter can be sold. Due to this, the maintenance visits are based on the operators' experience and the geographic diffusion adds one more problem to the operation routes in which, for example, a vehicle can do 30 kms. to visit a machine in a petrol station though it does not need maintenance nor replacement of any product.

[0010] On the other hand, nowadays new types of vending machines sell products that need cooling and heating for the preparation and/or conservation of the product, this makes it necessary to design new systems

to control these new technology machines.

[0011] In the case of soda machines and even more in ice-creams machines, the internal machine temperature is a critical parameter.

A long-lasting power failure, an involuntary disconnection of the machine or a breakdown in the compressor system can raise the temperature of the machine causing the complete loss of goods with the consequent economic loss for the operator company and/or the consequent danger for public health due to the sale of the product in bad conditions.

[0012] In case the machine breaks down during the period of time that goes from the moment in which the machine breakdown is notified to the operator company until the technician has the occasion of visiting the place in function of his routes or his planification, the collection is obviously none. Moreover, the machine can break down being it difficult for the employee of the shop where the vending machine is installed or even for the collector to appreciate the fact that the vending machine is out of order such as the wrong rejection of coins and others of difficult prediction and only detectable through a statistical check of the coins admission, sold product, and that all together will give information about deviations related to the typical working of these machines. This checking through non automatic methods after the cashing up is done can take even months, because the statistical check can only be done after several visits of the operators; nevertheless, through automatic methods is almost immediate.

[0013] To sum up, nowadays the operation is carried out through purely manual methods. Apart from this, in the case of new products, in other words, of new vending machines in the market, the result of the operation can only be estimated after months of operation, without existing in the present technology a way of knowing in real time the results of it or other parameters as the sales rush hours, the number one selling products, geographic places where different types of machines and/or products exploded have more or less success, and similar studies that permit the engineering and marketing departments of the operator companies obtaining a fast and liable image of the impact and possibilities of new vending machines, in real time.

STATE OF THE ART

[0014] The attempts to conceive control systems for such machines have been several. We can mention:

- The patent US. A. RE 29,450 (GOLDSBY) of 1.977.
- The patent US. A. 5,339,250 (DURBIN) of 1.994.
- The patent US. A. 4,412,292 (SEDAM) of 1.993.
- The patent US. A. 4,853,684 (HOPPSTADTER) of 1.989.
- The patent US. A. 5,091,713 (HORNE) of 1.992.
- The patent PCT/US 94/09126 (ELDREDGE) of 1.993.

[0015] in these patents' systems of remote monitoring of vending machines from a central computer are conceived. The mentioned systems include sensors that monitor the running of the machine and send alarms to a communications' system that connects through a modem with a remote central station where data can be historically processed to obtain information about the state of the operation. The lack of diffusion of the described patents can be attributed to the many technical problems of infrastructure and operative costs that have the described systems in the mentioned patents.

TELEPHONE LINE CONTROL.

[0016] First of all, the telephone line linking systems, being either dedicated or by commutated network, have a prohibitive operation cost due to the fact that each machine must be connected to its own telephone line and the problem begins with the need of contracting and paying these new phone lines to an operator. Moreover, a common telephone line can be subject to its fraudulent use, because it is easy even for a non expert, to connect a telephone and make calls through the cable of the telephone line, and on the other hand, machines can not move to more profitable places without cancelling the telephone line and applying and paying a new one.

PRIVATE RADIOFREQUENCY NETWORK CONTROL

[0017] As an alternative method of trying to give solution to the mentioned disadvantages in the case of the cable lines the radiofrequency method was proposed. In it the vending machine is connected to a radiofrequency transceptor (transmitter-receiver) in a private network, and the data is sent through a cordless modem. This system has new disadvantages because the vending machines operator must ask for one or more radiofrequencies that are scarce and can not be even available in cities where the radiofrequency spectrum is saturated. On the other hand, fares to maintain frequencies of dedicated use are high in all developed countries. To end with, this system is economically unviable out of small towns where the maintenance and implantation costs of a remote network of repeaters and transceptor stations to link with the vending machines makes the system to have no practical application due to the implantation costs.

ANALOG MOBILE CELLULAR TELEPHONE CONTROL.

[0018] A possible solution for the problems shown by private radioelectric networks is using the public mobile or cellular phone networks. A radio cellular system (figure 6) basically consists on a large number of radioelectric stations, called cells or base stations, that have a multichannel equipment and an interface that connects the transceptor voice channels to telephone cable

lines. So each base station is a cell of a great panel, where the geographic area in which the mobile service is intended to be given radiofrequency coverage is being supplied through an indeterminate number of cells whose own radiofrequency scope is linked to the neighbours. When a mobile telephone user moves, the dedicated software cell system provides the best terminal coverage by means of different cells and makes a change between voice channels and the new cell transceivers by means of a hand-off commutation. The complexity of the complete description of a mobile cellular radio system escapes from the scope of this patent application and can be found in specialized literature such as the works of WCYLEE Mobile Cellular Telecommunication and MOULY and PAUTET GSM Mobile Communication. Nevertheless, it is necessary to understand the invention, to briefly describe how a communication in the mobile phone cellular systems is established. First of all, there are two types of channels in the transceivers of the base stations: the control channel, through which the calls to mobile terminals and from these are made and, the voice channels. If a base station has for example twenty-one channels, one channel is exclusively destined for the task of control channel, and the rest, that is twenty, are destined for voice channels. When a communication towards a mobile terminal is established it is notified with a code through the control channel in which the receiver of the mobile terminal is permanently hearing and the mobile terminal answers through this same channel so the base station recognizes the terminal within its radioelectric coverage, assigning immediately a voice channel through which the corresponding communication is established.

[0019] Since the beginning of the 1980s the cellular analogic system has had a great development under the variants AMPS in North America and South America in the band of 800 Mhz and TACS in West Europe in the band of 900 Mhz. Later, at the beginning of the 1990s noticing the explosion of the data communications and of the internet several companies decided to develop specific modems that would permit sending data through analogic mobile phone networks, in both AMPS and TACS forms. Nevertheless, these systems had a great lack of reliability.

[0020] Researches of the inventors of this patent, reached the conclusion that there were two causes of the malfunctioning of the analogic cellular phone modems. On one hand, the phenomenon called fading, radiofrequency phenomenon very common in high frequencies where the signal reflections and diffractions cause phase inversions which produce zero signals called drop-outs or complete loss of radiofrequency coverage. This disadvantage does not disappear with the lack of movement from the mobile terminal, because the signal received is as affected by its own movement as much as by the reflection and diffraction in objects that necessarily move among it. On the other hand, the jump between cells, called hand-off, implies a cut in the voice

channel of even 600 milliseconds of duration, being this an excessive period of time in data communications even using low transmission speed and/or error correcting systems. Not even in this case, this effect can be eliminated in stationary mobile terminals, not only because of the movements of the objects around, that implies as we have seen big signals variations and even its loss, but also because in the analog mobile phone systems, the base stations control software is continuously reassigning the voice channels with the aim of obtaining the best use of the network so the changes of the voice channel among the same cell and among neighbouring cells with shared coverage are constant, mostly in the urban center, nevertheless the mobile terminal remains fixed.

[0021] This effect by its own, without disturbing so much the voice communication, makes almost impossible the communication of data through channels that have been designed by the engineering system for its use as voice due to the continuous cuts that have a duration of 600 milliseconds and technology of the beginning of the 1980s.

THE DIGITAL SYSTEMS AS A NEW OPTION: ASSOCIATED COSTS.

[0022] To finish with, digital mobile phone technology has been recently introduced into Europe and in the United States with the GSM system in the 900 Mhz band in Europe and the PCS system in the 1900 Mhz band in the United States. This system does allow the possibility of sending, in a reliable way, digital information for data communication, because the own system is digital and the analog-digital conversion can be eliminated. In these systems the communication is not disrupted in its voice channels by jumps among base stations through hand-off, because the system reinstates the lost signal through a digital protocol without a single bit of information been lost in the hand-off.

[0023] As a consequence of this, mobile digital cellular phone systems can be a technical alternative to the problem of the remote control of vending machines. Nevertheless, a problem of costs exists that can make not feasible this alternative as a cheap solution.

[0024] The operators of the mobile digital cellular offer, together with the traditional use of voice, specific channels to transmit data and fax, but that in reality, are supported by voice channels, without having the use of this commercial formula any technical advantage of any spectrum efficiency. On the other hand, the operators invoice the clients separate connection fares and monthly fares for those who demand these services.

[0025] In the establishment of a call through a voice channel, although it is done through a direct digital interface and what is going to be transmitted are data, it is count as a call establishment, with a minimum plane fare added to a time faring and where the minimum to count is one minute. So the use of a voice channel al-

though the sending of data does only need of a few tenths, it must be paid as the establishment of a normal voice call with its corresponding invoicing, paying for the time used that actually has not been used.

[0026] On the other hand, the intensive use of voice channels in this sort of networks, can cause to the operators problems of saturation in urban centers with high density of communications. When a call is generated through a GSM system, some information process resources are used in the network to locate the mobile terminal, to confirm the coverage among other parameters and to assign a voice channel. This process, that lasts seconds, is repeated each time a call is set up with its corresponding use of the network process resources and of the radioelectric interlase spectral occupation. The use of these resources to send a data message of a short duration has a very low efficiency.

OBJECT OF THE INVENTION

[0027] Due to the above mentioned problems, it can be said that vending machines need of a remote monitoring operation system to combat fraud in the collection, to improve management and to eliminate costs. Nevertheless, the reasons why other systems have not reached a minimum of acceptance are due to a high cost of establishment, operation and maintenance and to a lack of reliability in the technical proposal to send data. With these premises and due to the previous state of the art, the inventors have conceived a new system which sensors, that control the key points of the machine, are connected to a microprocessor based low-cost controller, connected at the same time to an own design cordless modem (figure 1) compatible with the SMS Short Message Service format or short message system of the GSM specification documents 07.05 and 07.07 of the GSM specification phase II of July 1996. The GSM system is nearly identical to the American PCS, and the implementation of the invention in this system is also viable.

[0028] The invented system therefore uses the existent mobile digital cellular system networks having several special features. From a technical point of view, as voice channels are not used and due to the fact that the data sent from the vending machine is of a short length, it has no sense using process resources and of spectrum utility derived from the traditional network running. From an economical point of view, not using voice channel implies that there is no faring of this service with its corresponding operative saving of the proposed system.

[0029] The short message system was conceived as a means to combine the use of mobile GSM telephones with beeper services that already existed. Originally this service is usually unidirectional, in other words, the person that wants to leave a message calls to a call center and indicates the message and the user's number. The center processes the message sending it to the mobile

terminal. Nevertheless, the mentioned specification allows the bidirectional use of sending messages either fixed-mobile, mobile-fixed, as mobile-mobile.

[0030] To assign a voice channel to send the data chain having the operation results is not necessary with this system. The diffusion broadcast channel is permanently transmitting different data chains with information related either to the system parameters either to the call processor to the terminals. So, the spectrum occupation of the diffusion channel is permanent, even in case there is no traffic or just some. The SMS system uses blanks in the diffusion channel to transmit short messages without using the process or additional spectrum.

[0031] Sending short messages through a cellular mobile system operator, due to its characteristics, is subject to an agreement between the operator and the user, being the cost among the 5% and the 15% of the cost of the first minute of a voice communication. Due to the fact that the system is completely digital it does not need an analog conversion modem. The SMS format uses an efficient error correcting system as well as a message reception confirmation code, through which the message is being repeated until its automatic reception is confirmed.

[0032] On the other hand, the manufacturing cost of a wireless modem compatible with the SMS format is lower than that of other technical solutions. It is lower than the analog solution due to the high integration level and to the almost unexistence of adjustments and calibrations lower than those of the digital traditional voice operation system, because circuits that are left can be eliminated. In other words, the vocoder, the transducers, such as the microphone and earpiece, the display and its control circuit among others. In this way, the resultant establishment cost is low due to the use of an existent network and to the low cost of the equipments to be installed in the vending machine.

[0033] The SMS data network has the form of figure (2) and allows sending through the GSM system diffusion or broadcast channel a maximum of 160 ASCII characters of seven or eight bits, the length of this network is more than sufficient for the pretended object.

[0034] The needed wireless modem must be compatible with the mentioned technical aspects specifications of the short message system for GSM networks and its diagram is shown in figure (1).

[0035] Data that are sent and received from the wireless modem to the controller are encrypted through a set of algorithms with the aim of avoiding the possibility of an illegal reading through a clonic terminal. The encryption is made in the controller itself through a dedicated owner firmware.

[0036] During the last years several sets of integrated systems have appeared and are used in the workmanship of GSM mobile terminals, and that allow any normal expert in the subject, to make the proposed wireless digital modem compatible with the GSM system SMS specification. The integration level is so that the integrated

circuits are really blocks that contain for example the radio frequency transceptor, or the GMSK modulation-desmodulation circuits, the controller with the data ports so the task of design and realization of the prototype is enormously simplified and shortened, also mentioning as appropriated to the aim of the necessary wireless digital modem design, the information about the sets of integrated circuits of SIEMENS, COMMOQUEST or ANALOG DEVICES.

DESCRIPTION OF THE FIGURES

[0037] Figure (1): Block diagram of the wireless SMS GSM/PCS specification format compatible modem according to 07.05 and 07.07 series of the ETSI documentation. Signal comes in through the antenna and through a duplexer (4) enters a low-noise amplifier (1). Signal is filtered by (2), preferably a superficial wave filter and goes to a GMSK demodulator (3) which passes the signal to a base band processor (9), that decodes the SMS data chain and passes the information to the rest of the systems. In the transmission chain, the signal is generated by a voltage-controlled oscillator (8) which passes its signal to a controlled (10) frequency synthesizer (7). The synthesizer signal is then given to a GMSK modulator (6) and, after being filtered (13), is passed to a two watt PEP power amplifier (5). The signal then passes to the duplexer (4) to be sent by the antenna. The system also carries memories with the firmware (12) and a smart card memory (11) supplied by the operator previous contract of the access to the SMS system.

[0038] Figure (2): It is an example of coding-decoding that shows the data chain. In (1) the message to be sent is shown, in which the data that come from the vending machine operation have previously been encrypted. After it is prepared with a BCS format in (2) to insert lately the beginning and ending counters in 10H DLE and 03H ETX and among them is the content of the message that is transmitted among (3) and (4) and that it is shown in case there are no errors in the interface in (4), where the beginning and ending counters are detected and eliminated in (5) in which, after the BCS is proved, the original message is obtained in (6).

[0039] Figure (3): Shows a block diagram of the subsystems and circuits of the equipment to be installed in the vending machine. A complete description of the utility of each block is going to be found afterwards, in the preferent way of execution. The main subsystems are the interfaces block with the machine (1), the controller that includes memories, the real time clock and the resident firmware (2) supplied by a power supply with battery (5) being the purpose of the wireless SMS modem (3) and the local network communication equipment to connect with other machines located in the surrounding areas (4).

[0040] Figure (4): It is a block diagram suggested by the remote control center in which (26) is a wireless compatible SMS modem as the one described in figure

(1). (27) is a controller connected to one or more surrounding peripherals (29). The controller has storing means and a group of logical instructions concerning data base (28). Moreover, there exists the possibility of consulting data with a previous enter code from a terminal even if it is remote or portable.

[0041] Figure (5): It is an establishment proposal with in the vending machine and that can have different variants in function of the available space and the type of machine.

[0042] Figure (6): It is a diagram of the base stations' distribution in a mobile cellular system.

DESCRIPTION OF THE PREFERRED EXECUTION SOLUTION.

[0043] The present patent intends to establish an effective, technically viable and reliable and economically viable system with the aim of solving the present problems of the vending machines operation as it has previously been defined.

[0044] EQUIPMENT TO BE INSTALLED IN THE MACHINE figure (3). The nucleus of the invention is a system to be installed in the vending machine, whichever is its manufacturer or whatever is its age, and that is located in a box, in which the following modules are found:

[0045] A group of modules of electronic interface (1) that, through different connections to the vending machine, in function of the type or model of it, has the task of capturing and sending electric signals of its circuits, and adapting the impedance levels and galvanically isolating these connections in the way they do not affect the normal running of the vending machine.

[0046] A controller module (2) which preferent execution can consist of a microprocessor with multiple analogic and digital inputs/outputs that will be connected to the interface module previously described. The controller will be also equipped with a real time clock and a EPROM type memory system or similar that will have a firmware programme with the logic support adequated to the aims of the invention. And others of the type of RAM or EEPROM for the temporal storing of the obtained data, useful to know about the operation and its alarms as it will be defined later.

[0047] A bidirectional wireless communication modem compatible with the SMS format of the GSM standard (3), which block diagram in more detail is shown in figure (1), is used to send data obtained from the interface through the diffusion or CBCH broadcast channel without using voice channels, which block diagram is specified in figure (1).

[0048] A short range communication bidirectional module (4) equipped with a modem that can be a radiofrequency one, or a special one as to send data through the electric network, which aim is the reception and the sending of data and instructions among the different existent networks in a same local or locals that

are near, so a single SMS modem is used as the one described in previous number (3), bringing together in a local environment the sending of data of several machines through a single SMS module.

[0049] An AC power supply module or power supply obtained from the DC available in the vending machine (5) with a filter and a stabilizer having a tampon mounted battery so that the system normally works even sending operation data to the central even if there is no power supply to the vending machine.

[0050] The subsystems (1), (2), (3) and (4) previously described are interconnected among them by a system of two or more bidirectional wires with TTL or RS232 logic levels, depending on the means used. The communication modules and the controller module are equipped with the corresponding shields to avoid electromagnetic interferences or radiofrequency ones among the different modules. Moreover, high loss ferritic cores will be used to avoid blocking of the controller system because of the entrance of interferences due to electromagnetic radiation coming from the cordless modules because of their radiofrequency mean. These anti-interfering measures are not vital, but are thought to improve the reliability of the invention.

[0051] The interface module (1) can be connected as it is described in figure (5) through an external wiring (26) and connects the box (25) where the machine processor is located (28) to the sensible points of the vending machine including the counters (27). These, by way of stating and not limiting in function of the type of machine, manufacturer and data wished by the exploded companies, are the following:

[0052] Connection at the out put (6), which counts the impulses that are sent from the microprocessor of the vending machine to the admission counter (electromechanic or electronic) as a parallel accounting of it and, antifraud system provided with an impedance sensor that detects the wiring manipulations of the mentioned counter being this useful for the business manager and for the person responsible for the machine takings. The mentioned connection will go to an input of the controller module so the mere manipulation of the wiring to the counter is detected by the impedance variation registered in the circuit.

[0053] Inspection connection (7) to control the opening and closing of the vending machine by means of the circuit that exists in the door to the corresponding control module enabling to establish when it has been visited and the time it has been opened.

[0054] Connection for a continuous monitorization (8) of the electric network supply of the vending machine, to detect when the machine has been disconnected or the power supply has failed, and the duration of these periods during which the operation is impossible. And in which, moreover, in case of cold products, stock can get lost because it is perishable.

[0055] Connection to the "out of order" indicator light (9) that when it is permanently on, usually indicates

breakdown and, due to this, the impossible machine's operation. Likewise, when this same connection is intermittent, usually indicates the condition of "no change" or "reccoverable breakdown" of the vending machine, enabling to detect with a digital sensor any of these two anomalous operation situations.

[0056] Direct connection to the microprocessor reset (11) if it has one of the vending machine (zero beginning point of all the systems), enabling its setting up after the machine controller has stopped or as it is commonly said, hung, enabling the operation reset of the affected vending machine with a big operative save, without the necessity of waiting for the visit of a repairing technician.

[0057] Direct inhabilitation connection (12) of the vending machine, making it useless from the operational central without being necessary a repairing technician visit, therefore, avoiding the visit cost and the claims or losses due to the wrong running in the operation due to the loss of stock or disagreement with the place where the operation is been carried out.

[0058] Connection to the system battery (13) to verify its good state, due to the fact that, as it is known, due to aging they stop storing energy or, due to longlasting network disconnections, the battery in its normal running can reach a level of discharge that unables the correct running of the system.

[0059] Connection to one or more digital thermometer sensors (10) to verify temperatures in one or more points of the machine, for example in soda machines, ice-creams machines, or others that sell hot products, to verify temperature and to avoid alarms when they exceed the running allowed limits, avoiding the loss of the stored products in case the cold/hot systems break down.

[0060] Connection to a mercury or gyroscopic sensor or, in general, to any movement sensor that detects vending machine movement, avoiding vandalism and even the robbery of the whole machine.

[0061] Connection to a multiple group of sensors in each product channel (22) enabling the obtention through piezoelectric measure means, weight measure means or, optic means, as so to measure the quantity of product in each channel enabling to programme the replacement of the product and maintenance of the machine always on.

[0062] Connection to the water supply entrance (23) in machines that use it as in car washing machines or automatic laundries, detecting the lack of sufficient flow or pression.

[0063] Connection to auxiliary deposits (24) as those of automatic soap dispensers of the machines that carry out washing processes or toner in photocopiers or ink in printing mechanisms enabling the natural punctual product replacement.

[0064] Connection to air pressure sensors (25) in machines such as vacuum cleaners operated by coins in petrol stations, enabling to predict when the machine deposit is full or its obstruction by objects, programming

the maintenance in a efficient way.

[0065] The above connections are stated in an unlimited way insofar as many other possible configurations that are evident do not constitute innovation according to the invention.

[0066] The above described connections are useful for the installed equipment in the vending machine to obtain in real time, the good running and state of the vending machine essential parameters. These parameters are stored as logic data in a controller system memory during a continuous operation of thirty days of maximum, although this limit has a mere practical interest because in a necessary case this storing capacity could be multiplied by the memory chips mere exchange with others of more storing capacity.

EQUIPMENT TO BE INSTALLED IN THE OPERATION CENTRE

[0067] The operational centres can be located due to its small size (figure 4) in any office within the operator company. It is composed of a communication module (26) with a cordless modem compatible with the SMS format as the one in figure (1). At the same time, they are connected to a controller (27) that can be an owner platform (SUN, Digital, HP) or to a compatible computer, Macintosh or PC, or, using a specific owner electronic microcontroller. As peripherals (28), any type of monitor that enables to visualize the software screens of management, control, fraud detection and alarms and, a printer, it is better if it is a color one, to print the alarms reports, historical lists, diagrams and histograms of the comparative results of alarms and operation would be necessary but not indispensable for the whole system operation.

[0068] In an alternative execution and previous agreement with the operator the operational central can be directly connected through a dedicated or commutated line directly to the SMS system server of the cellular mobile operator, option that can be of interest in case of big vending networks.

[0069] In case an alarm is received from a vending machine due to a detected anomaly, an auditive and optic alarm will ring in such computer or controller and a printed report will be preferently issued for its verification with the event's date and hour, as well as recorded in the historical data base.

[0070] The historical data base (29) will be relational and will present through the parameters chosen by the operator in order of dates, machines' identification codes, the name of the place where the operation is executed, shops' addresses and telephone numbers, entering codes or terminal numbers of the chosen operator, license machine number, type of machine and others available or those that would be of interest for the operator company. Moreover, the results of several operator companies could be consolidated and data could be received in a single operational central, with the conse-

quent synergy and costs' save. The operational central can also be connected through any communication means to an incidental terminal (30) been fixed or portable so people authorized can gain access through authorization codes to the operator central data.

OPERATION DATA CONSULTING

[0071] Data can be looked up gaining access to the computer or owner microcontroller through an access system hierarchical by levels so it is necessary to introduce a code to gain access to the programme and different levels of importance are allowed in the consults in function of the operator hierarchical level.

The preferent consulting ways can be

Through generation from the vending machine.

[0072] In case there exists an alarm in the vending machine, in other words, that an anomalous situation has been detected in the operation, the corresponding data will be sent to the detected alarm, stating its date and hour, and moreover, all those data derived from the operation, stored in the memory until this moment and from the last sent data, to verify in a better way the possible causes of the anomaly.

Through consult from the central

[0073] Through consult from the central putting automatically into all those data derived from the operation stored in such memory to verify in a better way the possible causes of the anomaly.

Programmed consults.

[0074] Through programming, sending the central to the equipment to be installed in the machine, register of hours and days of the week in which the system will send the operation data to the central in an automatic and programmed way.

FRAUD CONTROL AND INSPECTION PROCESSES OF THE VENDING MACHINE THROUGH THE SYSTEM FROM THE CENTRAL.

Complete reset of the controller of the vending machine.

[0075] It often occurs that a static discharge, a micro means failure or quick turning on and off, the microprocessor systems on which the vending machines controllers are based, get locked or "hung" being necessary for a maintenance technician to move with the single aim of pushing the internal switch or "reset" or a complete reset of the vending machine controller. Through the interface module (11) corresponding to the equipment installed in the vending machine the system will be reset

through the appropriate order from the operational central, avoiding the maintenance technician to go and therefore saving costs associated with him.

Without change or recoverable breakdown.

[0076] When the vending machine has no change or suffers a soft breakdown (jammed coins or similar) this condition is detected through the corresponding interface module (9) so the maintenance visit can be programmed at the importance level of the detected alarm or warning the operation shop manager from the operational central.

Out of service

[0077] When the vending machine runs out of service this condition is detected through the corresponding interface module (9) enabling the operator to programme the corresponding maintenance visit.

Admitted Payment Counters manipulation.

[0078] In case of fraudulent manipulation of the admission coins counters circuits or other ways of payment, the corresponding interface module (6) sends the corresponding alarm, this is warned in the operational central and the necessary measures can be taken.

Vending machine opening

[0079] In the control station the corresponding warning is received from the equipment installed in the vending machine through the signals received from the corresponding interface module (7) enabling to control if the calendars and maintenance predictions given to the operators are fulfilled and enabling an optimization of the processes and maintenance routes.

Machine with no power supply

[0080] If the vending machine suffers consecutive and quick power cuts or a longlasting one, such alarm is detected through the corresponding module (8) and sent through the system to the operational central, from where the shop manager can be warned of the detected situation, for its solution by its own or to programme the corresponding maintenance visit.

FUNCTIONAL DESCRIPTION OF THE MAINTENANCE SYSTEM PROCEEDINGS

[0081] The invention also allows the maintenance of the vending machines without any operators' visit with the following preferent maintenance means.

Process of counters equipment to be installed in the machine

It would be useful in the following two cases:

- A possible system breakdown.

[0082] In case the received data show conflicts due to possible interferences in the data sending or even any wrong running in the equipment to be installed in the vending machine, there exists the possibility, through the reset module (14), of resetting the stored registers without eliminating the historical data nor the alarm ones, so cleanness of the counters data is achieved and due to this a new counting from zero of the system.

- Simultaneous resetting with the cashing up

[0083] In case the operator company wishes to reset the machine simultaneously with the cashing up, without erasing the historical data, nor the alarms ones, in other words, with the collection of the coins by the person responsible of it of the operator company, there exists the possibility of resetting the stored registers in the equipment to be installed in the vending machine, that the central operator will select.

Complete reset of the controller system or reset of the system

[0084] A complete reset of the controller system through the module (15) can be executed through the sending of a code from the operational central, by stopping the microprocessor and turning it on again, so in an eventual situation of hanged of the controller system, it begins working without the the operator visit, therefore saving costs.

[0085] Inhibition of the transmission mode of the wide range communications module in the miniature communications equipment with the operational central.

[0086] Due to its design the equipment to be installed in the vending machine will send through the communications system a warning of those alarms that are been registered. To avoid this, the sending of these alarms occur in a unwanted manner during the period of testing assembly, reparation, storing, system's breakdowns or similar situations, from the central the transmitter equipment can be inhibited through the inhibition module (16) avoiding the central to get stopped and producing the use of communications networks with the subsequent expense for the operator, when the vending machines are not in active operation.

[0087] Sincronization or put on time with the clock of the central of the equipment to be installed in the vending machine.

[0088] As it is known, the microprocessor systems clocks in real time lack precision and stability of temperature adecuated for a synchronized running in large pe-

riods of time. Due to this, a module of synchronism (17) has been planned between the clock in real time of the equipment to be installed in the vending machine and the operational central that will serve as a unique pattern for the rest of the remote controllers through the sending of a code of updating hour.

Detection of bad state or discharge of the system battery

[0089] The system allows to detect the charge and maintenance state of its own battery through the module (13) enabling to programme the maintenance of it minimizing the times the system stops because of this cause.

INTERFASE FOR OPTIONAL CONNECTIONS

[0090] The following optional system connections can be established to other external systems of the vending machine among which some studied options are identified without any limitative intention.

[0091] Connection to the local alarm where the operation is been executed through the special interfase module (18) that allows to receive its shot as an added alarm in the operational central, with advantages for the shop security where the operation is executed. The sending of the alarm is done through the own SMS system without using the voice channel.

[0092] Connection to a public coin, credit card, microchip or radiofrequency working telephone, through a separate contract from the cellular mobile network system with plain utilization of the voice channels and the use of an specific mobile system terminal, offering an auxiliar service to the local where the operation is been executed and using simultaneously the voice channels that are not used in the system remote control. This is carried out through a special interfase (19). In this way, the vending machines operators, as well as the owners of the place where they are installed, can offer a complementary service to their clients and charge percentages of the calls made obtaining a new method of economic incomes without the necessity of a specific PSTN telephone line for the service of public telephone of the business.

[0093] Connection to an external or integrated display in the vending machine that through the special interfase module (20) can be a CRT tube, plasma, LCD, TFT, incandescent luminic matrix or semiconductor LED or even frontal projection or retroprojecting with the aim of showing in the operation shop publicity messages of any kind of product, of legal marketing, according to the legislation in force regarding publicity. Publicity will be prepared or be modified from the operational central also through the remote control mentioned above. Messages will be alphanumeric or graphic, monochrome or in color and could show figure animation and/or that of the images. Messages will be sent from the operational central through the voice channel through a separate service

contract and a specific terminal not used in the remote monitor of the machines and through a digital interfase, once the equipment installed in the vending machine has received the data, they can be shown in the corresponding external audivisual display in the chosen times and sequences by the programmer without later intervention of the operations central. In this way, different publicity messages can be programmed in function of the type of machine, place where the operation is going to be executed, objective public profile, timetable (morning, afternoon, night or a combination of them) and calendar.

INDUSTRIAL USE

[0094] The possibility of the invention industrial use is evident because of its own description within the field of vending machines manufacturer companies as an added value to its product, for companies that run vending machines, as a fraud detection system in their best operation, saving personal costs and improving quality, presentation and state of the sold products. Moreover, in their optional modules the invention has also interest for any type of places where we can find the machines, for companies that offer public phone service and for publicity companies.

Claims

1. Fraud vending machines inspection system through remote control, that includes:

One or more impedance sensors connected to the wiring that connects the admitted payment means to the controller of the vending machine and to the counters of collection of the vending machine, so any manipulation of such wiring is detected as an anomalous condition of the operation.

A controller circuit connected to the impedance sensors and to others, with means to read, store and process the read data.

A telecommunication subsystem connected to the controller that sends the data of the anomalous operation of the impedance sensors that control the counting circuits and others that wish to be controlled, to an operational central through a communication network.

2. Vending machines system against vandalism and antitheft by means of remote control, that consists of:

One or more sensors that include means to detect the movement of the vending machine so any vibration or anomalous movement is detected as an alarm.

A controller circuit connected to the mentioned sensors and to others with means to read, store and process the read data.

A telecommunication subsystem connected to the controller that sends the alarm data to an operational central through a communication network

3. Vending machine control system by means of remote control that consists of:

One or more temperature sensors that send the exact temperature of the sensor probe element to control the temperature inside new models of vending machines in elements such as cold store, ovens or deep fryers that are necessary in machines that sell cold or fried products, where an exact control of temperature is necessary to maintain the quality and hygiene of the sold product

A controller circuit connected to the mentioned sensors and to others with means to read, store and process the read data.

A telecommunication system connected to the controller that sends the alarm data to an operational central through a communication network.

4. Management, control and inspection fraud system in vending machines collection that includes a group of sensors set in the machine. Each sensor produces a signal in function of the operative states of it and are connected to a controller circuit that is able to read, store and process the data, characterized by the use of a digital modem that uses the diffusion channel or CBCH broadcast of the GSM paneuropean system or of the american PCS without using voice channels, avoiding the counting, compatible with the standard defined in documents series 07.05 and 07.07 of the GSM specification phase II of july 1996. This digital modem sends the operation data to a remote controller located in the operational central.

5. The system defined in claim number 4 in which the remote controller in the operational central has means to produce historical reports and alarms and of supplies of each vending machine, means to produce comparative statistic graphs of the operation, means to store the data of the operation, and means to determine and indicate that there exists deviations of the typical running of the vending machines in function of the received data by all of them

6. Management, control and inspection vending machines system according to claim 5 characterized because the operational central is going to be able to have one or more satellite systems that would be

able to connect with it through telematic means to look up from different emplacements even through portable systems so the operation data can be consulted without the necessity of going to the offices of the operator company with the corresponding enter code.

7. Management, control and inspection vending machines system according to claim 4 characterized because it consists of an interface module (6) enabling to count in parallel the admitted means of payment and directly from the controller of the vending machine.
8. Management, control and inspection vending machines system according to claim 4 characterized because it counts with control means in real time of the impedance of the circuits that go to the counters that the machine has inside from the controller of the vending machine and that are used to check or cashing up of the quantities.
9. Management, control and inspection vending machines system according to claim 4 characterized by having a module (7) to register opening doors and the duration of such opening.
10. Management, control and inspection vending machines system according to claim 4 characterized by having a module (8) to monitor in real time the electric power supply of the vending machine.
11. Management, control and inspection vending machines system according to claim 4 characterized by having a module (9) of detection of the condition "out of order", "no change" or "recoverable breakdown" of the vending machine
12. Management, control and inspection vending machines system according to claim 4 characterized by having (13) a monitor module in real time of the autonomous supply module (5) with the aim of detecting the discharge or mistioning of the battery before it unables the correct system running by means of sending the corresponding alarm to the operational central.
13. Management, control and inspection vending machines system according to claim 4 characterized because it has a machine shut-off module (12) that allows the complete shut-off of the vending machine from the operational central.
14. Management, control and inspection vending machines system according to claim 4 characterized by having a sincronization module (17) or timing of the clocks of the equipments to be installed in the vending machines from the operational central.

15. Management, control and inspection vending machines system according to claim 4 characterized by having a module of counter reset (14), without deleting the historical data nor the ones of the alarms, that were stored in the controller module (2), cleaning the data of the counters and enabling a new counting from zero. 5
16. Management, control and inspection vending machines system according to claim 4 characterized by having an equipment total setting up module (15) to be installed in the vending machine (figure 1) or reset, that enables the system maintenance without been necessary for a technician to go to the place where the operation is been carried out if the system gets locked. 10 15
17. Management, control and inspection vending machines system according to claim 4 characterized by having a module (16) that enables to disqualify from the operational central the transmission systems located in the telecommunication modules (3) (4), avoiding in case of tests of setting up, storing, or system breakdowns, the saturation and the cost of using such telecommunication modules. 20 25
18. Management, control and inspection vending machines system according to claim 4 characterized by having a remote maintenance system of vending machines through a resetting up module (11) or complete reset of the vending machine through remote command. 30
19. Management, control and inspection vending machines system according to claim 4 characterized by having means to measure the quantity of product in the channel of each of the products sold. 35
20. Management, control and inspection vending machines system according to claim 4 characterized by having available means to measure the deposit of auxiliar products that the machine uses to offer the service and that are not sold to the client. 40
21. Management, control and inspection vending machines system according to claim 4 characterized by having available means to measure the input and/or output water volume of flow and water pression from vending machines even detecting maximum and minimum levels. 45 50
22. Management, control and inspection vending machines system according to claim 4 characterized by having available means to measure the input and/or output air volume of flow and air pression from vending machines even detecting maximum and minimum levels. 55
23. Management, control and inspection vending machines system according to claim 4 that enables to have available a special module (18) that allows to connect the local alarm where the operation of the equipment to be installed in the vending machine (figure 1) is being carried out, so the alarm is transmitted through the telecommunication system.
24. Management, control and inspection vending machines system according to claim 4 characterized because the system has a special module (19) to connect a payment telephone to the telecommunication system using the voice channels of the cellular network and sending simultaneously data through the SMS chain of the diffusion or broadcast channel of the operation data.
25. Management, control and inspection vending machines system according to claim 4 characterized because the system has available a special module (20) to connect an external audiovisual display enabling to send the audiovisuals contents through the telecommunication system and programmes from the operational central.
26. Management, control and inspection vending machines system according to claim 4 characterized by having available encryption means of the data sent to the operational central from the vending machine or towards it with the aim of avoiding the illegal reception of them.

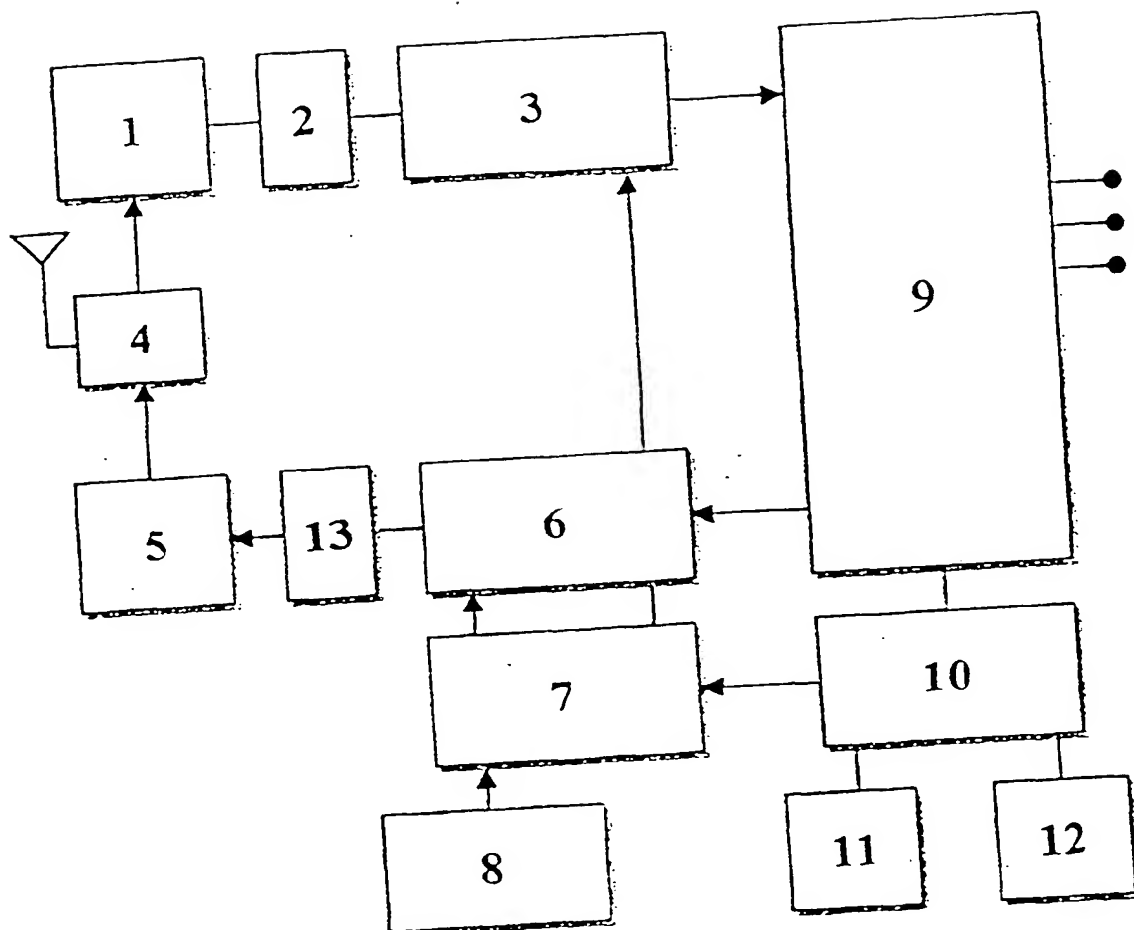


FIG. 1

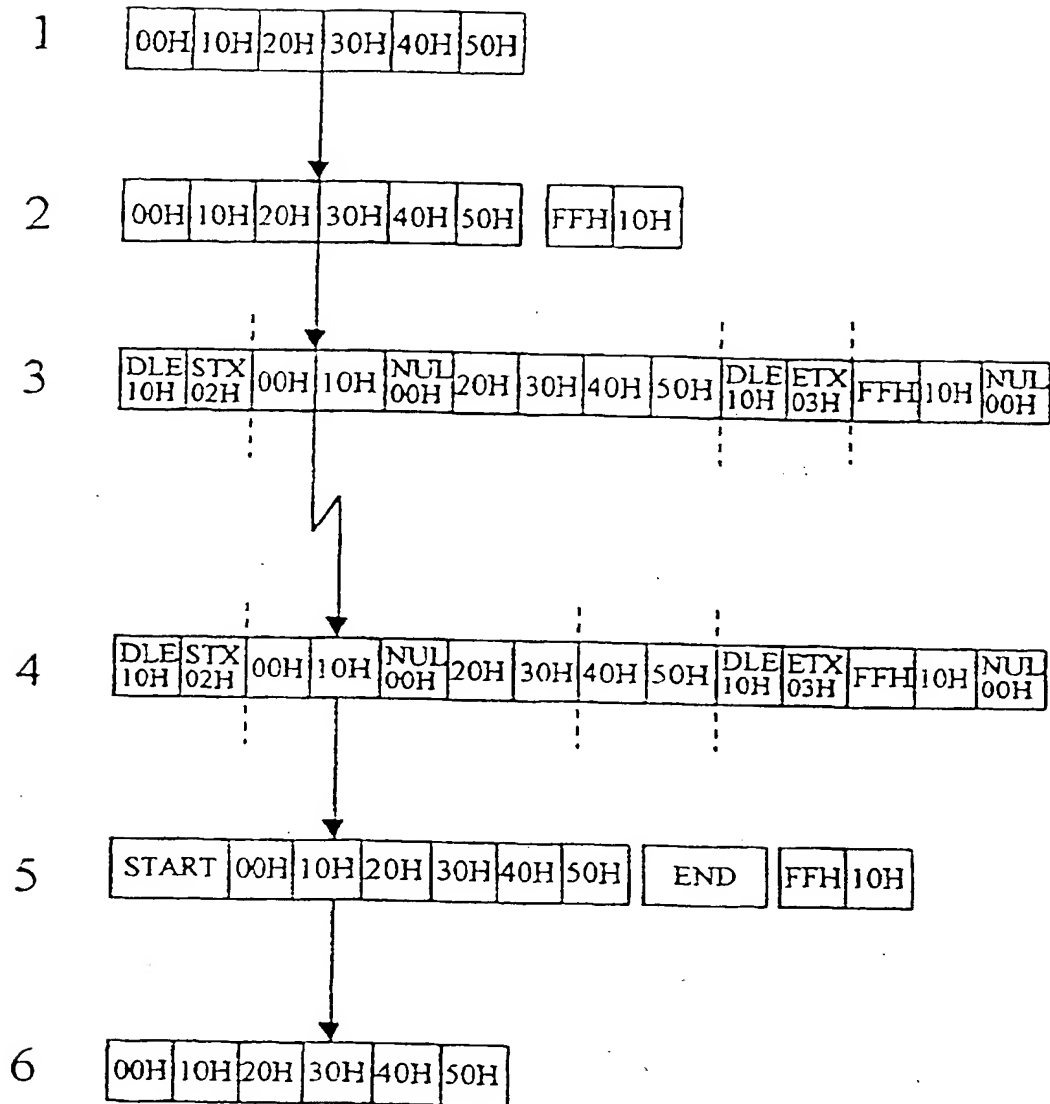


FIG. 2

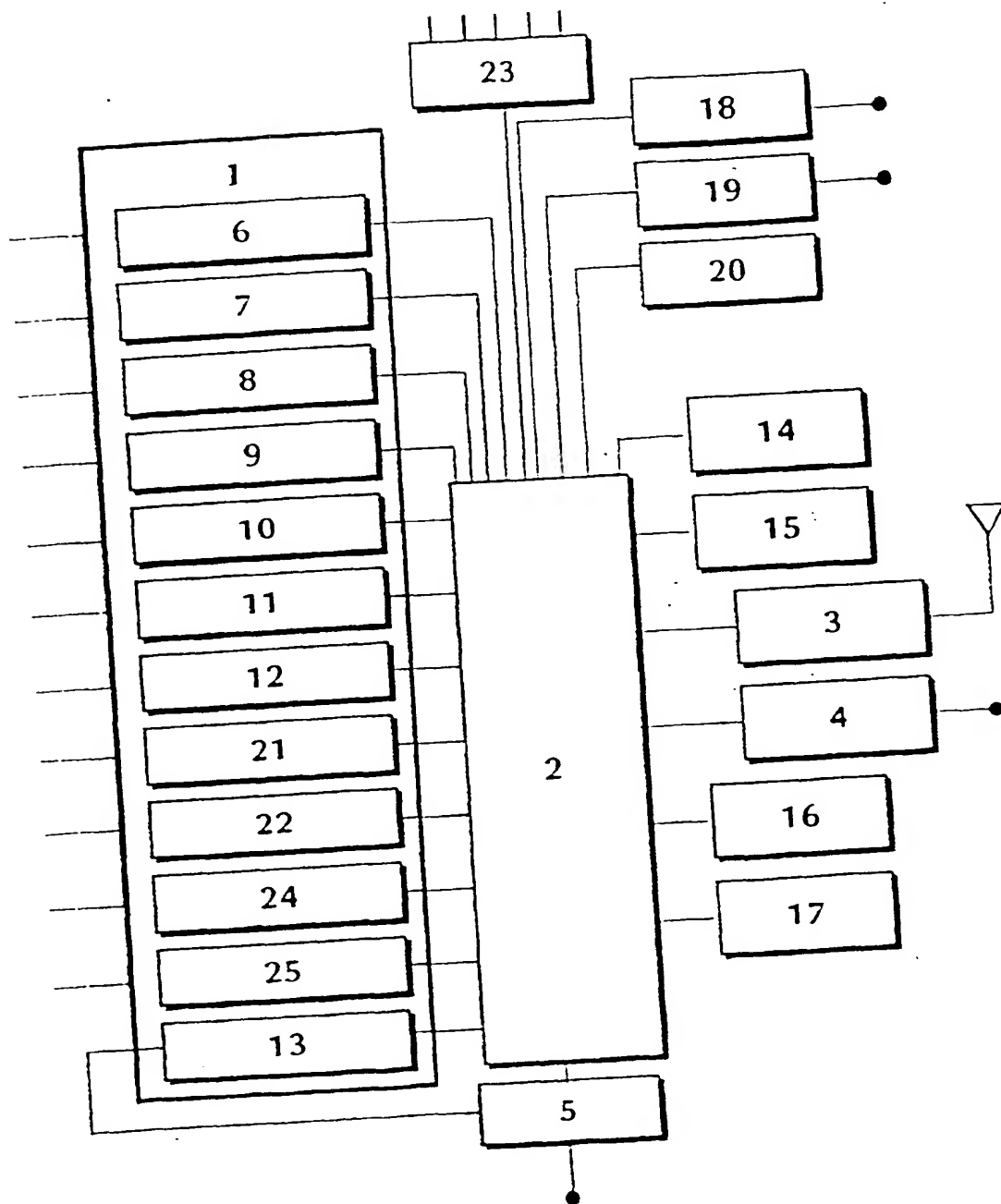


FIG.3

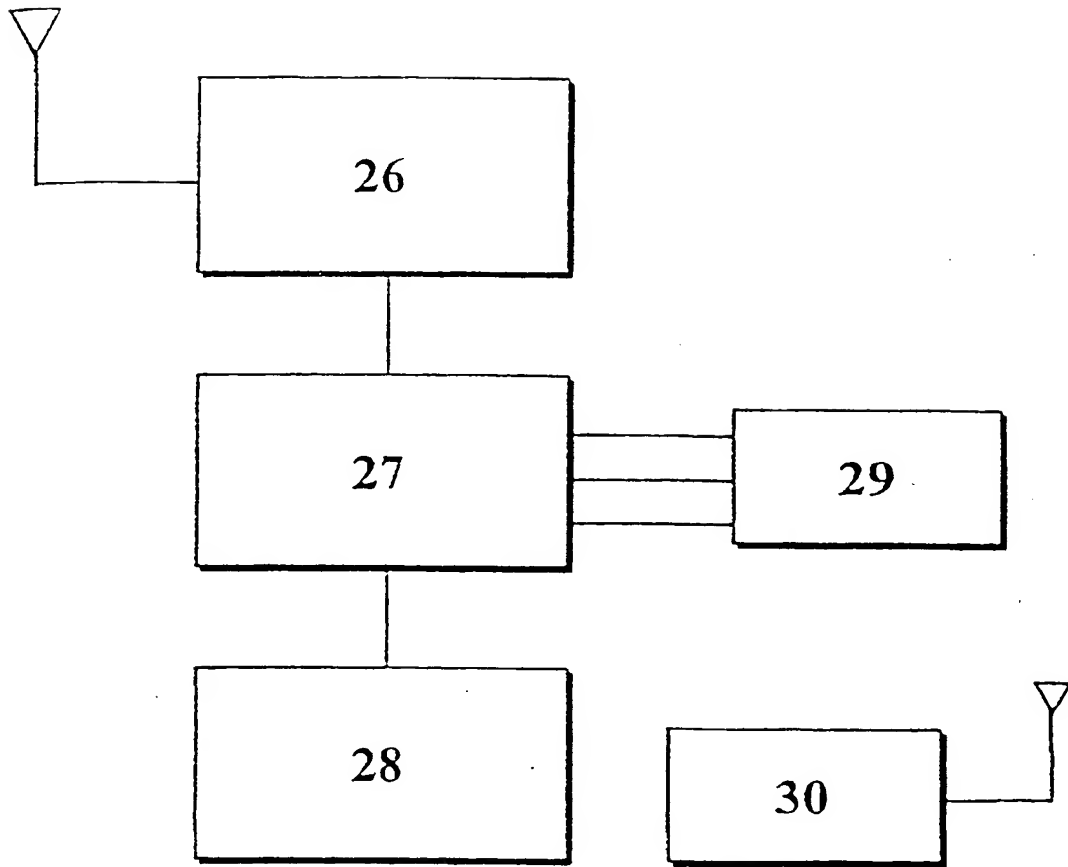


FIG.4

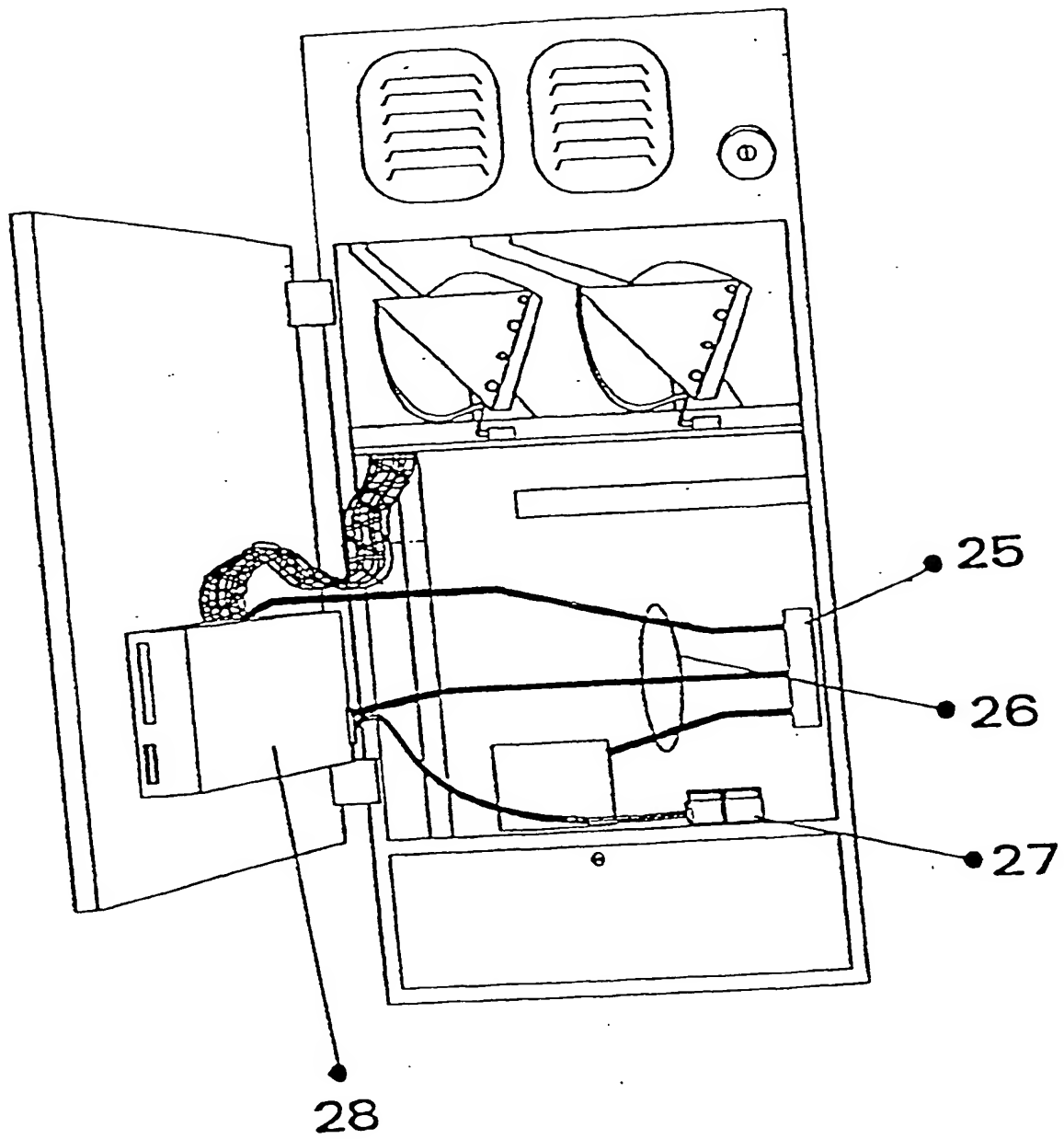


FIG. 5

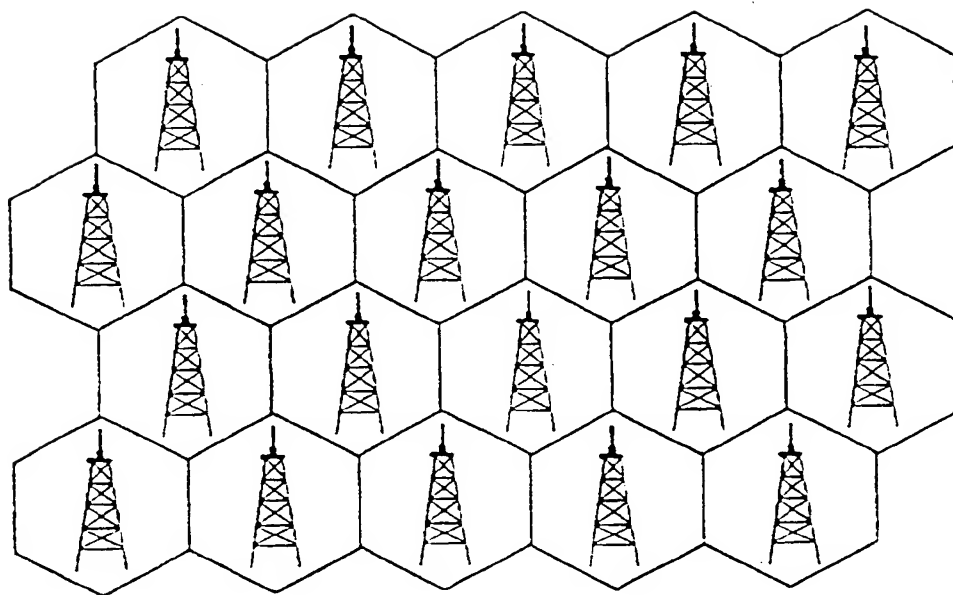


FIG 6.

INTERNATIONAL SEARCH REPORT

International application No
PCT/ES99/00302

A. CLASSIFICATION OF SUBJECT MATTER:

IPC: H 04 Q 7/22, G 07 F 5/18, G 06 F 17/60, G 08 B 25/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

IPC: H 04 Q, G 07 F, G 06 F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WIPL, PAJ, CIBEPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	Base de datos WPI en EPOQUE, Londres, semana 198616, clase S01 AN 1986-100785, DE 3 427 635 C (ENDRESS & HAUSER) 10 April 1986 (10.04.86), abstract, figure	1
X	Base de datos PAJ en EPOQUE, JP 04-276898 A (OMRON CORP) 02 October 1992 (02.10.92), abstract, figure	2
X	Base de datos INSPEC en STN, Institute of Electrical Engineers (Stevenage GB), Inspec 1997:5533005, EVANS T.F., "Celllemetrysm-telemetry via cellular", abstract, Virginia Tech's Sixth Symposium on Wireless Personal Communications, 5-7 June 1996 (05-07.06.96)	4

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search
08 February 2000 (08.02.00)Date of mailing of the international search report
15 February 2000 (15.02.00)Name and mailing address of the ISA:
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES99/003C2

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	WO 9719547 A1 (AXION LOGISTICS CORPORATION) 29 May 1997 (29.05.97), abstract, page 3, line 25; page 6, line 27; page 14, line 9-25; fig. 1B	4, 5, 7, 9-23, 25
Y	Base de datos PAJ en EPOQUE, JP 04-255294 A (NEC CORP) 9 September 1992 (09.09.92), abstract, figure	4, 9-22
P,Y	US 5 889 474 A (LaDue) 30 March 1999 (30.03.99), abstract, column 9, line 9-53; column 16, line 39 - line 64; fig. 1B, E	4, 9-22
P,A	US 5 950 771 A (Stapp) 27 July 1999 (27.07.99), abstract, column 5, line 27 - column 6, line 14; column 7, line 6-16; fig. 1, 2	4, 5, 7, 25
A	US 5 442 568 A (Ostendorf et al) 15 August 1995 (15.08.95), abstract, column 4, line 22 - col 5, line 50; column 6, line 50 - column 9, line 8; fig. 1-3	5, 7, 9
A	EP 0 758 777 A2 (PALOMAR TECHNOLOGIES CORP) 19 February 1997 (19.02.97), abstract, column 4, line 22 - column 5, line 21; fig. 1	26

INTERNATIONAL SEARCH REPORT

Information on patent family members:

International Application No.
PCT/ES99/00302

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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DE 3 427 635	10.04.1986	NONE	
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